2) What is growth curve? Describe the bacterial growth curve.

Ans. Bacterial growth is exponential or logarithmic i.e. in a bacterial culture the population doubles as it generates bacterial growth in a culture medium batch culture. When the logarithm of the number of bacteria per unit volume of a such batch culture plotted against time begining with the transfer of some viable organism with the culture vessel a sigmoid growth curve is obtained.

A typical growth curve shows four distinct phases — 1) Lag phase
2) Log phase / Exponential phase
3) Stationary phase
4) Death / Decline phase

1) Lag phase — It is the initial period of growth during which there is no increase in the number of cell. It is the phase of cell enlargement in which the organisms are physiologically very active and synthesized new protoplasm. There is an increase in total protein RNA and cell phosphorus content. It is the phase of

adjustment necessary for the synthesis of intermediate metabolites enzymes and coenzymes. In brief in this phase the organisms are metabolising and growing but there is no cell division.

2) Log phase or Exponential phase — After the end of Lag phase the cells divide steadily at a constant rate. If the log of the number of cells is plotted against time on a graph paper, it results in a straight upward line. In this phase the cells are in a state of balanced growth i.e. the number of cells increased a such a way that a avarage composition of cell remain constant for a certain period of time. In the phase the cells are smaller in size as they constantly divide and the entire population is uniformed with respect to cellular activity.

Towards the end of phase, the organisms continue to multiply at a slower rate. This is due to the depletion of nutrients and the accumulation of toxic waste product.

3) Stationary phase — In this phase the growth i.e. cell division almost ceases due to exhaustion of nutrients and also the accumulation of toxic products. At this stage the cell death starts at a slow rate and is compensated by the formation of new cell through cell division. This

the net viable population remain constant for sometime.

4) Death phase / Decline phase — During this phase there is a decrease in the number of viable organism with increase in time. The number of organism decrease exponentially i.e. half of the surviving cell die in each successive equal time interval. For example a population decreases from 1 million to 1/2 in the 1st hour, to 1/4 million in the next hour and so on. Thus the rate of growth is constant.

If nutrients and O_2 are supplied in the medium in the death phase, the bacterial population again increase and initiate a second log phase. This type of growth curve is known as Dioxygenic growth curve.

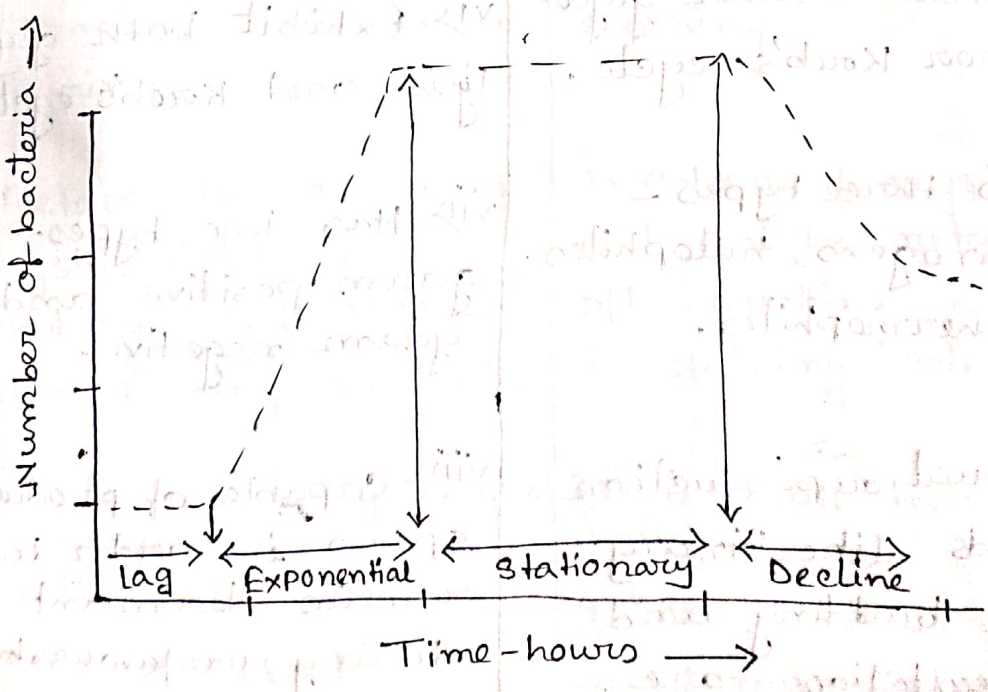

Fig:- Bacterial growth curve